Bioremediation of **Hydrocarbon Contaminated Soil**

The mandate of Natural Environment Recovery Inc. (NER) is to design and operate nature-friendly technologies to remediate contaminated soil, groundwater, freshwater and marine systems. To ensure that this mandate is carried out, NER combines expertise in project management, biochemical engineering, process chemistry and water resources. NER bas always been strongly committed to advancing its proprietary bioremediation technologies. In addition, NER continues to develop new ways of integrating other compatible technologies. making possible the treatment of a wider spectrum of contaminants and media.

G.F. Itamunoala. President Natural Environment Recovery Inc. (NER) Richmond Hill, Ontario

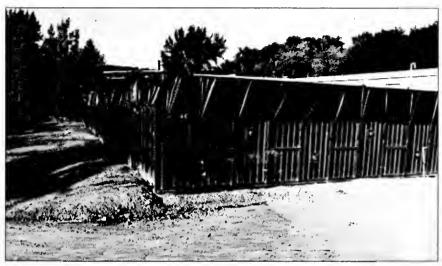
THE COMPANY

Natural Environment Recovery Inc. (NER) is a Richmond Hill-based company that provides cleanup services to industry, government and private landowners. These services include using bioremediation to destroy petroleum hydrocarbons in contaminated soils and groundwater. NER also provides rapid spill response services, hazardous waste treatment and passive cleanup systems based on the natural breakdown of inorganic and organic pollutants. One example of a passive system approach is the cleanup of acid mine drainage.

THE CHALLENGE

NER has demonstrated, on a commercial project, an ex situ (off site) bioremediation technology capable of:

- * breaking down a range of organic contaminants, including petroleum (BTEX) and PAH compounds;
- * treating a variety of soil types, from low-permeability clays to coarse grained sands;



NER set of 8 Bio-Reactors

- * operating safely in close proximity to a residential neighborhood;
- * meeting all these objectives at a cost that is competitive with other technologies (between \$50 and \$60 per cubic metre).

TECHNOLOGY DESCRIPTION

NER developed a mobile ex situ bioremediation technology. Bioremediation uses micro-organisms to break down contaminants into less harmful substances such as carbon dioxide and water. The NER bioremediation process adds natural acclimated microbes (bioaugmentation) and proprietary nutrients (biostimulation) to the contaminated media. Unique to NER is the nutrient Fiton™. Fiton™ causes the microbes to metabolize contaminants rapidly and enables aerobic microbes to function in areas where oxygen is scarce or virtually nonexistent. When using Fiton™, further addition of oxygen (air) is unnecessary.

The NER bioreactors hold the contaminated soil in modified, opentop marine containers (40 ft. long x 8 ft wide x 10 ft high). To distribute the microbial and nutrient suspension, the bioreactors use a combination of spray nozzles and subsurface injection probes. Each bioreactor runs as an independent unit with a capacity to treat approximately 50 m3 (100 tonnes) per batch. NER can operate its ex situ bioreactors in virtually any location accessible by transport trailer.

RESULTS

NER applied its ex situ bioremediation technology to the cleanup of approximately 7,000 cubic metres of hydrocarbon-contaminated soil. The demonstration site is located near Toronto's Don River, where the former Polyresins and Domtar facilities operated paint processing and paper manufacturing facilities respectively. NER was contracted by the Metropolitan Toronto Region Conservation Authority (MTRCA) to clean up the contaminated soil.

Results show that even highly impermeable soils (k, as low as 1.5 x 10-7 cm/s) can be treated to meet stringent environmental criteria quickly and cost-effectively. Soils containing high initial levels of petroleum hydrocarbons (including BTEX) and PAHs were cleaned up to Ontario Ministry of the Environment and Energy parkland/ residential standards.

TECHNOLOGY OPPORTUNITIES

Bioremediation provides a safe and reliable method of permanently destroying contaminants. With its ex situ bioreactors, NER is capable of providing on-site cleanup services with a high degree of process and material control.

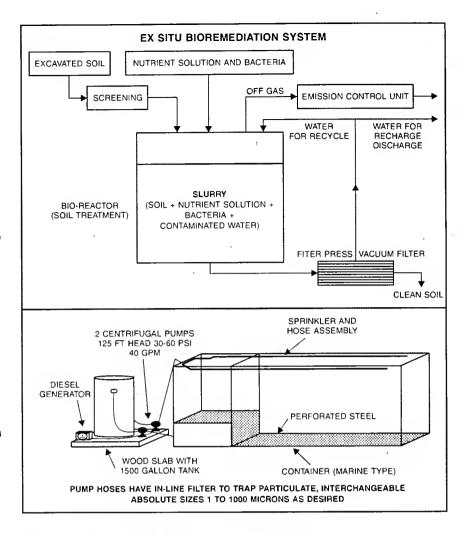
PARTNERSHIP IN POLLUTION PREVENTION AND RESOURCE CONSERVATION

The demonstration of this technology was partially funded by the Ontario Ministry of Environment and Energy and Environment Canada under the Development and Demonstration of Site Remediation Technologies (DESRT) program.

Industrial companies located in Ontario may participate in ministry/ industry programs which will help them:

- reduce, reuse and recycle solid waste;
- # effectively clean up historic pollution and destroy hazardous contaminants;
- reduce or eliminate liquid effluent and gaseous emissions;
- * use energy and water more efficiently.

Equipment and services supply companies can benefit from the information provided on technologies identified for business development.



FOR FURTHER INFORMATION, PLEASE CONTACT

Dr. G.F. Itamunoala President Natural Environment Recovery Inc. 100 York Bl., Suite 500 Richmond Hill, Ontario L4B 1J8 Tel: (905) 881-6011 FAX (905) 881-6015 Val Moraglia
Industry Conservation Branch
Ministry of Environment and Energy
56 Wellesley St. W.
14th Floor
Toronto, Ontario
M7A 2B7
Tel: (416) 327-8328
FAX (416) 327-1261

MINISTRY OF ENVIRONMENT AND ENERGY PROGRAMS

For information on Ministry of Environment and Energy assistance to industry, please contact the Industry Conservation Branch at (416) 327-1492, Fax (416) 327-1261

Publication of this project profile does not imply product endorsement. The ministry does not warrant the accuracy of its contents and cannot guarantee or assume any liability for the effectiveness or economic benefits of the technologies described in the report or that their use does not infringe on privately owned rights.

In addition, the ministry can not be held liable for any injury or damage to any person or property as a result of the implementation of any part of this profile.

This project profile was prepared and published as a public service by the Ontario Ministry of Environment and Energy. Its purpose is to transfer information to Ontario companies about new environmental technologies.

Renseignements en français

Ministere de l'Environnement et de l'Energie 56 rue Wellesley ouest, Toronto, Ontario M7A 2B7

Telephone : (416) 327-1253 Telécopieur : (416) 327-1261